

# Normal Distribution Worksheet

- A set of 1000 values has a normal distribution. The mean of the data is 120, and the standard deviation is 20.

  - How many values are in one standard deviation from the mean? **683**
  - What percent of data is in the range 110 to 130? **38.3%**
  - What percent of the data is in the range 90 to 110? **24.2%**
  - Find the range about the mean that includes 90% of the data? **lower = 87.1 upper = 152.9 = 65.8** invNORM
  - Find the range about the mean that includes 70% of the data? **lower = 99.3 upper = 140.7 = 41.4**
  - Find the probability that a value selected at random from the data will be within the limits 100 and 150?  **$\frac{140-120}{20} = 1 = .8413$  so above is 15.86%**
  - Find the point below which 90% of the data lie? **invNORM(.9, 120, 20) = 145.6**
- X is a normally distributed variable with mean  $\mu = 30$  and standard deviation  $\sigma = 4$ . Find

  - $P(x < 40)$  **99.4%**
  - $P(x > 21)$  **normalcdf(0, 21, 30, 4) = .0122**  
 **$1 - .0122 = 98.8\%$**
  - $P(30 < x < 35)$  **39.4%**
- A radar unit is used to measure speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. What is the probability that a car picked at random is travelling at more than 100 km/hr?  
**normalcdf(0, 100, 90, 10) =** **more than 100% - 84.13% = 15.86%**
- For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours.  
**normalcdf(50, 70, 50, 15) = 40.87%**
- Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 100. Tom wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Tom takes the test and scores 585. Will he be admitted to this university?  
 **$\frac{585-500}{100} = .85 < z$  score chart = .8023 he scored over 80%**
- The length of similar components produced by a company are approximated by a normal distribution model with a mean of 5 cm and a standard deviation of 0.02 cm. If a component is chosen at random:

  - What is the probability that the length of this component is between 4.98 and 5.02 cm? **68.26%**
  - What is the probability that the length of this component is between 4.96 and 5.04 cm? **95.44%**
- The length of life of an instrument produced by a machine has a normal distribution with a mean of 12 months and standard deviation of 2 months. Find the probability that an instrument produced by this machine will last:

  - less than 7 months. **normalcdf(0, 7, 12, 2) = 6.2%**
  - between 7 and 12 months. **= 49.37%**
- The time taken to assemble a car in a certain plant is a random variable having a normal distribution with a mean of 20 hours and a standard deviation of 2 hours. What is the probability that a car can be assembled at this plant in a period of time:

  - less than 19.5 hours? **= 40.12%**
  - between 20 and 22 hours? **= 34.13%**
- A large group of students took a test in Physics and the final grades have a mean of 70 and a standard deviation of 10. If we can approximate the distribution of these grades by a normal distribution, what percent of the students:

  - scored higher than 80? **.8413 but 1 - .8413 = 15.86%**
  - should pass the test (grades  $\geq 60$ )? **= 15.86 but 1 - .1586 = 84.13%**
  - should fail the test (grades  $< 60$ )? **15.86%**
- The annual salaries of employees in a large company are approximately normally distributed with a mean of \$50,000 and a standard deviation of \$20,000.

  - What percent of people earn less than \$40,000? **30.2%**
  - What percent of people earn between \$45,000 and \$65,000? **37.2%**
  - What percent of people earn more than \$70,000? **16.48%**
- In a city, it is estimated that the maximum temperature in June is normally distributed with a mean of 23° and a standard deviation of 5°. Calculate the number of days in this month in which it is expected to reach a maximum of between 21° and 27°. **30 days**
- The mean weight of 500 college students is 70 kg and the standard deviation is 3 kg. Assuming that the weight is normally distributed, determine how many students weigh:

  - Between 60 kg and 75 kg. **.95(500) = 475.89**
  - More than 80 kg. **.0004(500) = .214**
  - Less than 64 kg. **.0227(500) = 11.38**